

# Developing **Biofuel Production** in Missouri



Missouri Department of  
Natural Resources

Information for Planning Industrial-Scale Biofuel Facilities

## Introduction

Interest in biofuel production is growing in Missouri. Ethanol, made from corn and other plant material, and biodiesel, made from oilseeds such as soybeans as well as from used cooking oils, fats and greases, are the common biofuels produced in Missouri. When used appropriately in motor vehicles biofuels have been shown to have a net positive effect in reducing harmful air emissions, and, as fuels produced in Missouri, they contribute to the state's economic development. While some individuals may produce either of these fuels in limited quantities for personal use, the information in this brochure is for those who are considering developing an industrial-scale production facility. These fuels must conform to established industry standards before they will be eligible for commercial sale.



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## What are these fuels?

### Ethanol

also called ethyl alcohol or grain alcohol. It is most often produced by fermentation of sugars derived from plant materials. In the United States, corn is the most common feedstock. To be used as a motor fuel or fuel additive, ethanol must meet ASTM standard D4806-98 and must be diluted with a denaturant, such as natural gasoline, to make it unfit for human consumption. The energy content of ethanol is 83,333 British thermal units (Btu) per gallon versus 124,000 Btu per gallon of unleaded gasoline.

### Biodiesel

is a fuel produced by mixing vegetable oils, fats or greases with an alcohol (usually methanol but sometimes ethanol) and a catalyst. The production process removes free fatty acids and glycerin from the fuel thus allowing it to be used in any diesel engine with little or no modification to the engine or the fuel system. Biodiesel has improved lubrication characteristics when compared to petroleum-derived diesel, as well as an absence of sulfur. Biodiesel contains a bit more than 118,000 Btu per gallon compared to petroleum diesel's 129,000 Btu per gallon. To be marketed, biodiesel must conform to ASTM standard D6751.

## Business Development Considerations

Developing a biofuel production facility requires the diligence afforded any business investment decision. The good news is that in Missouri, several sources of support exist, as noted later in this brochure, to assist in investigating the potential for such a facility. Selecting an appropriate mix of charter steering committee members is an extremely important first step. This should be a diverse group that includes local leaders, business experience and independent thinkers so that all ideas get a complete consideration. This group will create the vision and mission statements for the project and resulting business.

In Missouri, the timeframe for developing biofuel production facilities runs from two to five years, starting with initial steering committee meetings through initial production. Steering committee members must be willing to commit substantial personal time to their committee duties for a long period of time. The construction period (part of the 2-5 year timeframe) from groundbreaking through initial production runs usually takes from 12 to 18 months.

Once the steering committee is selected, legal counsel should be retained. This counsel needs to be experienced in assisting business start-ups such as your group is considering. One of the first tasks of the legal team is to assist the steering committee in deciding on the best business structure. Since biofuel facilities often use farm-produced feedstocks, the formation of a cooperative as a full or partial owner of the project is an option that sometimes provides attractive tax treatment. Many biofuel facilities use the limited liability



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corporation (LLC) business structure. A farmer cooperative co-owns and a technology design-build firm and other investors serve as partners. The Agriculture and Small Business Development Authority in Missouri's Department of Agriculture can provide assistance in the formation of cooperatives. That contact information is listed in the section on Financing Opportunities.

The type of business structure employed can impact the carrying costs of project financing. If a cooperative structure is used, the equity received in the investor subscription process can be used to cover many initial development costs as the project management team is put together. If all project funds are borrowed from financial markets rather than owner equity, the interest costs

accrued between initial borrowing and initial product sales can be substantial.

As with any production business, a developer must investigate the market strength for the primary product as well as any secondary, or co-products. Ethanol co-products include distillers grains, which are used as livestock feed, and carbon dioxide, which is used in the food processing industry. Biodiesel co-products include glycerin or its higher-value derivatives. Glycerin is used in cosmetics and various chemical applications.

As foreign countries develop ethanol production capabilities, the potential for competition increases. This is a basic issue of price, supply and demand. Also, production of ethanol from cellulosic feedstocks is becoming commercialized. This process takes inputs such as corn stalks, grass or wood, extracts sugars from them and ferments those sugars into ethanol. As this technology becomes more cost-effective, it will allow much greater volumes of ethanol to be produced than from grain alone. This technology could be added to a traditional corn ethanol facility to expand that facility's production capabilities.

Based on current technology Missouri has a corn and grain feedstock base that will support approximately 400 million gallons per year (MGY) of ethanol production. This assumes a geographic distribution across the state of eight to 10 plants that average about 40 MGY production each. The combined output of Missouri's first three ethanol facilities is 110 MGY or slightly more than one-fourth of the full production potential of the state. A sustainable biodiesel production level is more difficult to determine as biodiesel can

be made from a wider range of feedstocks than ethanol, and the relative availability and cost of these feedstocks is a changing data point. One source of information on historic levels of corn and soybean production in Missouri is the on-line document: "An Assessment of Biomass Feedstock Availability in Missouri" available at: <http://www.dnr.mo.gov/energy/renewables/biomass-inventory2005-07.pdf>.

Location is an extremely important consideration in locating biofuel production facilities due to the costs of transporting the feedstocks as well as the finished products.

Information regarding highway transportation issues can be obtained from district offices of the Missouri Department of Transportation (MoDOT). Contact information for these offices is available by clicking on the map at: <http://www.modot.state.mo.us/>.

Ability of existing road networks to absorb increased traffic from large trucks must be considered as well as access to major highways. Rail transport is often a desired attribute of production facility locations. Information on rail transport availability and airport infrastructure can be obtained from MoDOT's Division of Multimodal Transportation by calling (573) 526-2169 or toll-free at 1-888-275-6636. Currently, natural gas is the fuel of choice for the production process, so proximity to a natural gas pipeline can be important. Other heat sources are discussed in the next section.

Once basic information regarding availability and cost of inputs has been gathered and an idea of project size has been determined, a coordination meet-

ing where technology, financial and environmental experts are brought together is of great help in making decisions on business structure, project implementation timelines and total financial requirements. This input will assist in business plan development and assist the steering committee in identifying appropriate experts from the organizations listed in this brochure to assist in business plan development.

Energy costs are the second highest input cost for ethanol producers, and historic energy price data can be obtained from the U.S. Department of Energy (DOE) Energy Information Administration (EIA) at <http://www.eia.doe.gov/>. Project developers may find that developing on-site energy production capabilities can provide a lower cost energy supply and serve as a hedge against radical energy cost fluctuations.

## Energy for Biofuel Plant Operations

Missouri has historically benefited from relatively low energy utility costs, but record setting prices in all utility and vehicular fuels were experienced in 2005. Price volatility is expected for the foreseeable future. New ethanol plants are beginning to look at combined heat and power as well as alternative energy systems as possible means to better control their energy costs. Biodiesel plants do not have as large a power demand as ethanol plants, but might still benefit from power produced with local fuel-stocks.

Missouri's Department of Natural Resources has collaborated to produce the Biopower Decision Tool, a spreadsheet-based calculator that can be used to conduct pre-feasibility analyses of the technical and economic feasibility for developing on-site energy facilities. Since most biofuel production facilities are built in rural areas, the possibility of an adequate amount of biomass energy feedstocks to power at least a portion of the plant's energy needs is high.



MO Soybean Association photo

Value-added economic development is a significant driver for most biofuel production facilities. The added local economic impacts of having local growers provide the power to run the facility can be determined with the decision tool. Use of the tool allows the user to make go/no-go decisions in this regard as a biofuel facility is being considered. Information on the tool is available from the department's Energy Center at 1-800-361-4827 or at [energy@dnr.mo.gov](mailto:energy@dnr.mo.gov). Also, the document, "An Assessment of Biomass Feedstock Availability in Missouri," contains information on feedstocks that could be used to fuel on-



# Environmental Permitting\*

PERMIT TYPE <i>AP = air pollution</i> <i>WP = water pollution</i>	FEES	CONSIDERATIONS IN PREAPPLICATION PLANNING	PUBLIC NOTICE	TIME TO ISSUE AFTER APPLICATION RECEIVED
<b>AP Construction</b> (below major emission levels)	\$100 filing fee; \$50/hour review time	<ul style="list-style-type: none"> <li>• Status of local air quality;</li> <li>• Expected emissions levels;</li> <li>• Distance to property lines;</li> <li>• Distance to other sources;</li> <li>• Selection of a qualified consultant</li> <li>• Visit DNR during early planning</li> </ul>	No	90 days on the agency clock
<b>AP Major Construction</b>	\$100 filing fee; \$50/hour review time	<ul style="list-style-type: none"> <li>• Monitoring status of local air quality;</li> <li>• Anticipated Best Available Controls;</li> <li>• Distance to property lines;</li> <li>• Distance to other emissions sources or pristine areas;</li> <li>• Selection of a qualified consultant</li> <li>• Visit DNR during earliest planning</li> </ul>	Yes	184 days on the agency clock (up to 12 months of preconstruction monitoring may be needed)
<b>AP Operating</b>	\$100 filing fee**	Performance testing (if necessary)	Depends on whether major or minor source	Up to 18 months after startup. Renewal every 5 years
<b>WP Land Disturbance</b> (greater than 1 acre disturbed)	\$300	<ul style="list-style-type: none"> <li>• Complete this early so it is not overlooked</li> <li>• Selection of a qualified consultant</li> </ul>	No	21-60 days on average
<b>WP Construction of wastewater treatment devices</b>	\$750 review fee; \$2200 review fee for flows greater than 500,000 gallons per day	<ul style="list-style-type: none"> <li>• Use and quality of receiving waters;</li> <li>• Nature of process wastewater</li> <li>• Selection of a qualified consultant</li> <li>• Visit DNR before plans are drawn up</li> </ul>	Yes	180 days maximum
<b>WP Industrial Pretreatment</b> (Will be handled under local utility authority; otherwise same as for construction permits)		<ul style="list-style-type: none"> <li>• Available capacity of local treatment;</li> <li>• Compliance of local treatment</li> <li>• Nature of process wastewater</li> <li>• Selection of a qualified consultant</li> </ul>		
<b>WP Operating</b> (includes runoff discharge, process wastewater discharge, and land application)	No filing fees**	<ul style="list-style-type: none"> <li>• Use and quality of receiving waters;</li> <li>• Selection of a qualified consultant</li> <li>• Visit DNR before plans are drawn up</li> </ul>	Yes (concurrent with construction permit notice)	180 days (developed concurrently with construction permit. Issued after construction completed)

\* Other agency approvals or registrations may be indicated in certain sites or for specialized operations.

\*\*Operating fees are assessed annually after startup based on quantity of emissions/discharges.



MO Soybean Association photo

site power plants and is available at: [www.dnr.mo.gov/energy/renewables/biomass-inventory2005-07.pdf](http://www.dnr.mo.gov/energy/renewables/biomass-inventory2005-07.pdf).

The U.S. Environmental Protection Agency (EPA) has instituted a program to support the adoption of combined heat and power (CHP) by various industries. Such systems provide both electricity and heating/cooling to a facility or group of buildings. On this Web page, [www.epa.gov/chp/project\\_resources/industry\\_specific.htm](http://www.epa.gov/chp/project_resources/industry_specific.htm), is information specifically dealing with the opportunities to use CHP in ethanol production.

Contractors considered for plant design and construction should be required to provide information on how they address issues of industrial process energy efficiency. DOE,

through its Industrial Technologies Program, provides an array of services and information resources that can help assure a highly efficient production process. Information from this program is available at [www.eere.energy.gov/industry/bestpractices/](http://www.eere.energy.gov/industry/bestpractices/).

## Environmental Permit Information

Today's industrial biofuel production plants will require air and water pollution control permits from the Missouri Department of Natural Resources. The type, nature, timing and cost of permits will vary depending on plant size, plant processes and plant location. The chart on pages 6-7 gives some brief information on each type of permit.

The department works hard to issue timely permits, but the number and quality of applications received at one time can lengthen the review process. Also, if additional data must be requested from the applicant, the permit review time will be lengthened.

State wastewater permitting can mostly be avoided if wastewater collection and treatment can be provided by the local wastewater utility. Involve them early in the planning stages.

Ethanol plants with expected production less than 60 million gallons per year, using natural gas as their primary fuel source, have been permitted as minor air pollution facilities. As new facilities are expected to get larger and possibly move toward coal as the source of heat, major air pollution source permits may be required. These permits require extensive air quality analysis, best available controls and public notice, all of which contribute to a longer permit process.

To avoid timing problems, applicants should contact the department at 1-800-361-4827 very early in their information gathering and business planning process. To help prepare for such a meeting, a review of the department brochure, "Understanding Environmental Regulations and Permits," (available at [www.dnr.mo.gov/pubs/pub595.pdf](http://www.dnr.mo.gov/pubs/pub595.pdf)) will provide a good picture of requirements for air emissions, wastewater discharges, hazardous waste generation/storage, tanks, groundwater protection and potable water systems. Department forms, instructions and information on permitting also are available at [www.dnr.mo.gov/forms/index.html](http://www.dnr.mo.gov/forms/index.html).

## Financing Opportunities

Many options are available for financing biofuel production projects. Initial construction costs for ethanol facilities in Missouri have run from \$24 million to \$60 million dollars depending on the date of construction and size of facility. Missouri projects can, in some instances, benefit from an array of public financing options in addition to traditional private sector finance.

The Environmental Improvement and Energy Resources Authority (EIERA), a financing arm of the Department of Natural Resources, offers traditional assistance through many types of tax-exempt and taxable financing. These programs are regulated by federal and state laws and may consist of issuing taxable bonds, floating or fixed-rate notes, short-to-intermediate term bonds and long-term bonds. Other types of assistance may include commercial paper and pooled financings. EIERA can be contacted at (573) 751-4919 or by e-mail at [eiera@dnr.mo.gov](mailto:eiera@dnr.mo.gov). The Web address is [www.dnr.state.mo.us/eiera/eiera.htm](http://www.dnr.state.mo.us/eiera/eiera.htm).

The Agriculture Business Development Division in Missouri's Department of Agriculture assists Missouri's agriculture-based businesses by providing high-quality business counseling, information and training on a sector-by-sector basis through its business and industry support program. Areas of specialization include capitalization, business planning, marketing, industry development, product and brand development, organizational structures and legal issues. The division is also home to the Missouri Agricultural and Small Business Development Authority (MASBDA), which provides a variety of financial

assistance programs, including tax credits, loans, loan guarantees, and grants for farmers and agribusinesses. The division's Web page is [www.mda.mo.gov/WhoWeAre/abd\\_div.htm](http://www.mda.mo.gov/WhoWeAre/abd_div.htm); the toll-free number is 1-866-466-8283. MASBDA can be reached by e-mail at [abd@mda.mo.gov](mailto:abd@mda.mo.gov). The phone number is (573) 751-5624.

Two other relevant programs administered by the Missouri Department of Agriculture are the Ethanol Producer Incentive Fund, and the Biodiesel Producer Incentive Fund. These programs provide grants, based upon program criteria, to producers of these products to encourage development of these industries in Missouri. Information for both of these programs is available at (573) 526-4892.

USDA Rural Development (RD) can provide financing for business development activities through a variety of grant, loan and loan guarantee programs. Eligibility for specific programs depends on the type of applicant and the nature of the project. For more information on RD's business programs and office locations, please visit [www.rurdev.usda.gov/mo/](http://www.rurdev.usda.gov/mo/). The RD state office in Columbia can be reached at (573) 876-0995. The program's staff can help identify which programs best fit your project's needs.

The Missouri Department of Economic Development has a suite of financial and incentive programs including tax incentives, public infrastructure financing, venture capital, workforce incentives, finance programs and redevelopment activities. Assistance can be accessed by e-mail at [dedfin@ded.mo.gov](mailto:dedfin@ded.mo.gov) and by phone at 1-866-647-3633.

## Other Resources for Project Development Assistance

Missouri Corn Growers Association (MCGA) has two staff dedicated to assisting interested parties with value-added projects, including ethanol production facility development, using protocols for developing business plans from consideration of feedstock availability through the pro-forma development stage. MCGA's ethanol Web site is [www.mocorn.org/ethanol.htm](http://www.mocorn.org/ethanol.htm). Its office in Jefferson City can be reached at 1-800-827-4181. The Missouri Ethanol Prefeasibility Evaluator was developed with assistance from MCGA, MASBDA and USDA-RD and is available on the Web at: <http://216.28.47.245/app/MCGA/>.

"Key Consideration Points to Ensure a Successful Business Plan for Developing an Ethanol Manufacturing Business," was written by Craig Tordsen, et al. of Iowa State University's Value-added Agriculture Extension program. It is available in 2002 at: [www.agmrc.org/NR/rdonlyres/CDAC2A71-7CE4-49AC-9CC7-38EDB06CBE2B/0/agmrcethanolcons.pdf](http://www.agmrc.org/NR/rdonlyres/CDAC2A71-7CE4-49AC-9CC7-38EDB06CBE2B/0/agmrcethanolcons.pdf). This publication provides a concise overview of issues that must be considered by anyone looking at developing an ethanol production facility. It can be used by someone considering a biodiesel facility as well, if the user substitutes biodiesel feedstocks and co-products for ethanol-related issues.

"Risk Factors in Ethanol Production" was produced by David Coltrain, et al., at Kansas State University in 2004 and is available at: [www.agmrc.org/NR/rdonlyres/0ED97642-8BCB-458F-B315-7DE44AF58FAD/0/ethanolriskfac-](http://www.agmrc.org/NR/rdonlyres/0ED97642-8BCB-458F-B315-7DE44AF58FAD/0/ethanolriskfac-tors.pdf)

[tors.pdf](http://www.agmrc.org/NR/rdonlyres/0ED97642-8BCB-458F-B315-7DE44AF58FAD/0/ethanolriskfac-tors.pdf). This reference breaks risk factors inherent in biofuel production facility development into three categories: processing technology risks, marketing and operational risks, and government and regulatory risks. Although written for ethanol production considerations, it provides a process to follow that will serve a biodiesel production development group as well.

The Missouri Soybean Association and Soybean Merchandising Council are national leaders in the development of biodiesel and can provide assistance in the development of such facilities. They have extensive experience in value-added project development, assisting interested parties with idea development, feasibility and business planning, equity procurement, permitting and pre-construction applications. They also lead Missouri's biodiesel promotion, education, research and development efforts, serving as the primary source of information regarding biodiesel growth in the state. They can be contacted at (573) 635-3819 or by e-mail at [mosoy@mosoy.org](mailto:mosoy@mosoy.org). Their Web page is [www.mosoy.org](http://www.mosoy.org).

Missouri is the host location of the National Biodiesel Board, which supports biodiesel industry development in the United States. It is located in Jefferson City and can be contacted at 1-800-841-5849, or by e-mail at [info@biodiesel.org](mailto:info@biodiesel.org). Its Web page is [www.biodiesel.org](http://www.biodiesel.org).

The Renewable Fuels Association, 1-800-542-3835 or [info@ethanolRFA.org](mailto:info@ethanolRFA.org), has produced the publication "FUEL ETHANOL Industry Guidelines, Specifications, and Procedures." It serves as a condensed technical reference for ethanol producers, ethanol blenders and other interested parties who need such information. It is available at: [www.ethanolrfa.org/objects/pdf/MemberDocuments/RFA\\_IndustryGuidelines.pdf](http://www.ethanolrfa.org/objects/pdf/MemberDocuments/RFA_IndustryGuidelines.pdf).



DNR photo by Scott Myers





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1-800-361-4827 [www.dnr.mo.gov](http://www.dnr.mo.gov)

*Front cover photo by Scott Myers.*

This publication is also available online at:  
[www.dnr.mo.gov/energy/renewables/biomass.htm](http://www.dnr.mo.gov/energy/renewables/biomass.htm).



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